Why Your Healthcare Business Intelligence Strategy Can't Win without a Data Warehouse

By Paul Horstmeier

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Will healthcare business intelligence (BI) be the answer that hospitals are looking for as they move to data-driven healthcare improvements and cost reductions? Yes … provided it's built on the foundation of a data warehouse. Here's why.

Healthcare is changing rapidly and so is the industry's need for analytics and business intelligence, which brings up a problem: what exactly IS healthcare business intelligence? The term itself has multiple meanings and can be difficult to define, which leaves organizations that know they need a solution wondering exactly where to turn.

The trouble stems from the overuse of the term "business intelligence." Sometimes business intelligence refers to a broad category of analytics, data warehousing and visualization tools, all of which are must-haves for any long-term and sustainable analytics foundation. Other times, business intelligence tools are linked to the visualization layer only – those tools that take the data and return a visual representation of it. Vendors including Qlikview, Tableau, Business Objects and Powerpivot work primarily with tools like this.

The more precise way of for healthcare to look at business intelligence may instead be in terms of a strategy – **what's your business intelligence strategy?** Regardless of your organization's answer, that strategy has one common and critical element: the need for a fundamental and foundational clinical data warehouse.

Where Healthcare Business Intelligence and Analytics Stand Today

Independent research firm Gartner, Inc., notes in its 2014 report, *Top Actions for Healthcare Delivery Organization CIOs, 2014: Avoid 25 Years of Mistakes in Enterprise Data Warehousing*, that

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the lack of a BI strategy is one of "nine fatal flaws in business operations improvement (BOI)" in healthcare. "Most vendors working in healthcare and other industries observe that healthcare has the most-complex data of any industry (possibly excluding government intelligence efforts)," the report states. At the same time, organizations aren't yet fully tackling their wealth of data. "The biggest flaw of all is the lack of a documented BI strategy, or the use of a poorly developed or socialized one."[1]

How big is the disconnect between data created and data digested? In 2010, Frost & Sullivan estimated that nearly 1 billion terabytes of data were held by hospitals and medical centers[2] – a number they project will grow to more than 40 times that amount by the end of the decade.[3]

Tackling the data paints a less rosy picture. Gartner's *Hype Cycle for Healthcare Provider Applications, Analytics and Systems, 2013*[4] report found that enterprise data warehouse (EDW) market penetration was in the "very low end of the 5% to 20% category," and "many health systems are still struggling to gain top executive commitment, justify the investment, build strong information governance and settle on an approach."

The value of the best EDWs comes to this: U.S. healthcare is undergoing dramatic, unprecedented change. The industry is shifting from fee-for-service to fee-for-value, yet without the historical investment in analytics technology so common in other industries and so essential to success. With healthcare reform and emerging models of care delivery, hospitals and medical practices need EDW solutions to reliably answer mission-critical questions about performance – as-is versus "what-if scenarios" and as-is versus competitor performance. Harnessing the combined data of clinical, financial, quality, cost and patient experience sources, EDWs enable such complex analysis. These platforms can help produce, for example, a monthly summary of operational value, defined as "outcomes per dollar spent."

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Understanding the Clinical Data Warehouse and BI Tools

In terms of business intelligence, the essence of data warehousing is measurement that leads to understanding, insight and action. In general, a data warehouse is a centrally managed and easily accessible copy of data collected from the transactional information systems of a corporation or health system. These data are aggregated, organized, catalogued and structured to facilitate population-based queries, research and analysis. Such queries, research and analysis enable measurement, which in turn enables understanding and the most informed business and clinical decisions.

The data in a data warehouse come from multiple source systems. Source systems can be internal, such as electronic health records (EHR) systems, costing or financial systems, or patient satisfaction systems; or external, such as systems associated with a state or federal government (e.g., mortality data or cancer registries).

Think of a data warehouse as a very large, very specialized kind of library – a centralized, logical and physical collection of data and information that is used repeatedly to achieve greater understanding or make the most informed decisions. Like a well-stocked library, the utility of a well-designed EDW is nearly limitless.

Three Key Benefits That BI Realizes with a Clinical Data Warehouse

The American College of Healthcare Executive's (ACHE) annual survey of the top concerns of hospitals found that financial performance topped the list for 2012, followed by patient safety, outcomes and healthcare reform implementation.[5] To address these concerns with the most informed decisions, management teams require reliable, comprehensive information spanning the enterprise.

In response, finance, quality, human resources and clinical departments at health systems and group practices scramble to compile data for their reports. Once departments complete this task, they must combine their reports so management can review progress on organizational goals. Management wants to see the big picture and draw valid conclusions about quality, satisfaction and cost performance across the organization.

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While this is a challenging, time-consuming process, a healthcare EDW can ease managementhe reporting and improve its efficiency in three ways:

1 Enabling a More Efficient, Scalable Reporting Process

Typically, hospital or group practice executives meet to determine the categories of healthcare data they need to track progress toward strategic goals. They may already have a process in place for getting financial data. But now, with new value-based purchasing pressures requiring clinical and financial data, organizations suddenly are tasked with getting more data than ever before. Questions may arise, such as:

- Where do I start?
- Who do I approach for the data?
- Where is the data stored?
- How do I get at the data after I've found it?
- How do I compile and make sense of it?

Locating the right people with the right data – whether it's a single person who updates an Excel document or a team overseeing a database – is a time-consuming, manual process. Staff spends a lot of time setting up this process to gather and compile data to keep executives up to date.

A healthcare EDW streamlines and scales this process. It integrates disparate data from a wide variety of sources, including billing, financial, patient satisfaction and clinical sources. Executives can access the information in the same place every month. And with the tools the healthcare EDW delivers, staff can analyze and interpret the data, running visualizations and reports, and gain insights into new and better ways to achieve quality and cost goals.

Texas Children's Hospital in Houston, the nation's largest children's hospital, has significantly improved efficiencies with EDW information delivery. On average, each EDW report costs 70 percent less to build than an EHR report. And, because the EDW visualizations enable end-users to quickly and easily drill down into the data, one visualization replaces 10 static EHR-generated reports.

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❷ Ensuring Consistent Data That Everyone Can Trust

Too often during meetings, people will present conflicting data or diametrically opposed trends in the organization's performance. Why does one team member's data show a different trend in net income than another's? Why does one clinical leader show that length of stay (LOS) is going down while another clinician's shows the opposite?"

When people throughout an organization access information in many different ways and from many sources, variability is common. The question is: Which data can the organization trust?

A healthcare EDW establishes a single source of truth and enables healthcare analytics. When data definitions and tools are consistent, as in a healthcare EDW, everyone – from frontlines to leadership – can rely on the accuracy of the information used to drive critical decisions. An EDW also serves as a foundation for developing and maintaining a data governance program. With such a program, data owners and experts can identify data issues within the organization, resolve them, determine who needs to use the data and define the best access path to the data.

❸ Enabling Meaningful, Targeted Quality Improvement

On an ongoing basis, multi-disciplinary teams from across clinical, technical, financial, quality and performance excellence departments can use the EDW to identify opportunities for improvement. The organization then can develop and deploy highly targeted, specific interventions to promote those improvements in care, whether it's lowering the rate of septicemia or eliminating unnecessary X-rays.

Consider this real-world example. When North Memorial Health Care adopted its EDW, the first order of business was to use it to identify areas of potential improvement. The organization landed on elective, pre-39-week deliveries as its first project. Jon Nielsen, M.D., medical director of women's and newborns service at North Memorial, noted at the time, "We wanted a project that we could get up and running quickly. Reducing deliveries before 39 weeks was an excellent launch point because there is significant peer-reviewed research in that area. And if we solved the problem, the scale of the services would allow us to significantly improve care as well as reduce costs quickly."

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North Memorial established a service-line guidance team of OB/Gyms, primary care physicians, nurses, data architects and outcomes analysts who standardized the workflow and created improved processes including, among other things, a checklist of requirements to determine if a specific early-term delivery was a medical necessity before it was scheduled.

The efforts paid off with the results showing a 75-percent reduction in elective, pre-39-week deliveries in just six moths. The win had another nice effect, too: it resulted in more requests for projects. That single source of truth, the EDW, continues to enable improvements to the hospital's cost and quality of care delivery.

Getting the Best Clinical Data Warehouse for Healthcare

The traditional approach to EDW architecture can be described as "early-binding." Prevalent in industries such as retailing that adopted data warehousing decades ago, early-binding data warehouses extract data from source systems and "bind" those data to business rules. In doing so, the data warehouse optimizes data for analysis and retrieval. This platform architecture applies business rules or data-cleansing routines very early in the data warehouse development lifecycle.

Early-binding approaches using enterprise data models are appropriate for business rules or vocabularies that change infrequently or in cases where the organization needs to "lock down" data for consistent analytics. It works great in industries including manufacturing and retail where products and/or components are well known and easily defined. In healthcare, however, the decision to bind early can have a huge, often negative impact on the success of data warehousing projects, particularly when early data binding removes key components of the data that would have been beneficial in later analysis.

Renowned healthcare organizations including Allina Health, Children's Hospital of Wisconsin, Crystal Run Healthcare, Indiana University Health, Kaiser Permanente, Memorial Hospital at Gulfport, MultiCare Health System, North Memorial Health Care, Providence Health & Services, and Texas Children's Hospital are opting to bind

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their data later using a different EDW architecture: a Late-Binding™ data warehouse.

The Late-Binding™ platform architecture delays the application of business rules (such as data cleansing, normalization and aggregation) to data for as long as possible, so clinicians have time to review and revise data, form hypotheses, and determine optimal analytic uses. Late binding is especially ideal for what-if scenario analysis and best suited to ever-changing healthcare data.

The Late-Binding™ model accelerates time-to-value. Instead of spending months and even years to bring up a data warehouse, many customers have launched in weeks. Indiana University Health, with 18 hospitals, 3,300 beds and 3,700 physicians, brought their Late-Binding™ Data Warehouse live in 90 days, including 14 billion rows of data representing over 10 years of clinical, financial, and patient satisfaction information.

Late-Binding™ data warehouses are also more scalable and adaptable to the problems healthcare organizations are trying to solve. Healthcare is undergoing changes to business rules and vocabulary at an unprecedented rate. A Late-Binding™ data warehouse provides not only faster time to value, but also the agility necessary to meet today's healthcare analytics demands.

A data warehouse developed with a late-binding architecture is the right platform for the healthcare industry because it has proven successful in numerous implementations by health systems across the country. This architecture has a track record of rapid time to value and the ability to address the demands of accountable care organizations. You can read a more detailed explanation of the Late-Binding™ architecture here.

Conclusion

Organizations and their leaders can harness the power of an EDW to streamline and scale reporting processes, maintain a single source of truth that everyone can trust, and drive meaningful, targeted quality improvement. By delivering analytics to clinicians and analysts on the frontlines of care — as well as to executives in the boardroom — healthcare organizations can critically evaluate care processes and aggressively pursue the best opportunities for improving outcomes. In doing so, healthcare organizations will be rewarded with clinical and financial success in a rapidly evolving healthcare landscape.

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How do we get there? Gartner's 2014 report may sum it up best: "Integrating business/financial and clinical data into an effective EDW is the top new IT initiative for CIOs once a generation 3 EHR system is deployed. …The value of the integrated EDW is high for organizations whose leaders grab hold of it with both hands."[6]

Endnotes

1. Shaffer, Vi and Mark A. Byer, "Top Actions for Healthcare Delivery Organization CIOs, 2014; Avoid 25 Years of Mistakes in Enterprise Data Warehousing," http://www.gartner.com/technology/reprints.do?id=1-1R0QJVG&ct=140221&st=sb, Gartner, Inc., February 10, 2014.
2. Frost & Sullivan, "Drowning in Big Data? Reducing Information Technology Complexities and Costs for Healthcare Organizations," July 14, 2011.
3. HIT Consultant, "Big Ways Big Data Could Add Value to Healthcare," http://www.hitconsultant.net/2013/05/29/big-ways-big-data-could-add-value-to-healthcare/, May 29, 2013.
4. Shaffer, Vi, "Hype Cycle for Healthcare Provider Applications, Analytics and Systems, 2013," https://www.gartner.com/doc/2568915/hype-cycle-healthcare-provider-applications, Gartner, Inc., July 31, 2013.
5. American College of Healthcare Executives, "American College of Healthcare Executives Announces Top Issues Confronting Hospitals: 2012," http://www.ache.org/Pubs/Releases/2013/Top-Issues-Confronting-Hospitals-2012.cfm, Jan. 7, 2013.
6. Shaffer and Byer, 2014.

Resources

- Clinical Data Warehouse http://www.healthcatalyst.com/clinical-data-warehouse-why-you-need-one
- 5 Reasons Healthcare Data Is Unique and Difficult to Measure http://www.healthcatalyst.com/5-reasons-healthcare-data-is-difficult-to-measure

About the Author

Paul Horstmeier brings 25 years of Fortune 500 and small business operations and general management experience to Health Catalyst. He co-founded HB Ventures and filled senior executive roles at HB Ventures portfolio companies. Within Hewlett-Packard, Mr. Horstmeier launched and grew three different businesses, including co-founding HP's commercial e-commerce business which later expanded to include the management of the data systems and infrastructure for marketing operations across the company. As Vice President of HP.com, he headed up a 700-person organization which was awarded nearly every industry award for quality and innovation during his tenure.

- Texas Children's Hospital Significantly Reduces Reporting Costs http://www.healthcatalyst.com/success_stories/tch-uses-healthcare-data-warehouse-to-slash-reporting-costs
- 4 ways to help your Healthcare data analysts be more productive http://www.healthcatalyst.com/enable-healthcare-data-analyst-part-two/
- Healthcare Analytics Adoption Model http://www.healthcatalyst.com/healthcare-analytics-adoption-model/
- http://www.healthcatalyst.com/wp-content/uploads/2013/07/HealthCatalyst-NorthMemorialcasestudy1.pdf
- Late-Binding™ Data Warehouse Platform http://www.healthcatalyst.com/late-binding-data-warehouse-platform
- Indiana University Health — A Cerner data warehouse in 90 days http://www.healthcatalyst.com/success_stories/how-to-deliver-healthcare-EDW-in-90-days/
- Value-Based Purchasing Drives Demand for Data Warehousing http://www.healthcatalyst.com/news/health-catalyst-to-present-at-iht2-07-4/
- The Late-Binding™ Data Warehouse Technical Overview http://www.healthcatalyst.com/late-binding-data-warehouse-explained/

ABOUT HEALTH CATALYST

Based in Salt Lake City, Health Catalyst delivers a proven, Late-Binding™ Data Warehouse platform and analytic applications that actually work in today's transforming healthcare environment. Health Catalyst data warehouse platforms aggregate and harness more than 3 trillion data points utilized in population health and ACO projects in support of over 22 million unique patients. Health Catalyst platform clients operate 96 hospitals and 1,095 clinics that account for over $77 billion in care delivered annually. Health Catalyst maintains a current KLAS customer satisfaction score of 90/100, received the highest vendor rating in Chilmark's 2013 Clinical Analytics Market Trends Report, and was selected as a 2013 Gartner Cool Vendor. Health Catalyst was also recognized in 2013 as one of the best places to work by both Modern Healthcare magazine and Utah Business magazine.

Health Catalyst's platform and applications are being utilized at leading health systems including Allina Health, Indiana University Health, Memorial Hospital at Gulfport, MultiCare Health System, North Memorial Health Care, Providence Health & Services, Stanford Hospital & Clinics, and Texas Children's Hospital. Health Catalyst investors include CHV Capital (an Indiana University Health Company), HB Ventures, Kaiser Permanente Ventures, Norwest Venture Partners, Partners HealthCare, Sequoia Capital, and Sorenson Capital.

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